

REMARKS

Summary

Claims 1, 12 and 16-18 are currently pending in the present application. Claims 1, 12 and 18 have been amended without adding new matter. Applicants respectfully request reconsideration of the pending claims in view of the amendments above and the remarks below.

Rejections under 35 USC §103(a)

Claims 1, 12, and 18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Matsuura (U.S. Patent No. 6,493,468) (hereinafter, "Matsuura") in view of Detachi (JP 2000-270222) (hereinafter, "Detachi")

Claim 16 is rejected under 35 U.S.C. §103(a) over Matsuura and Detachi, as applied to Claim 1 above, and further in view of Sato et al. (U.S. Patent No. 5,953,134) (hereinafter, "Sato et al.").

Claim 17 is rejected under 35 U.S.C. § 103(a) over Matsuura and Detachi as applied to Claim 1 above, and further in view of Tanaka et al. (U.S. Patent No. 5,760,831) (hereinafter, "Tanaka et al.").

Claim 1 is directed to an image processing device. The image processing device of Claim 1 includes: "inputting means for inputting an image; detecting means for detecting a face region in the input image; histogram generating means for generating a first histogram of the entire input image and a second histogram of the detected face region; calculating means for calculating a highlight point and a shadow point of the input image from the first histogram of the entire input image; first generating means for generating a gradation correction for luminance and a gradation correction for each of a plurality of color components based on the highlight point, the shadow point, a target highlight point and a target shadow point; conversion means for converting the second histogram based on the gradation correction generated for the luminance; determining means for determining a representative luminance of the detected

face region based on the converted second histogram of the detected face region; second generating means for generating an exposure correction based on the representative luminance; and correcting means for correcting the input image based on the gradation correction generated for each of the plurality of color components and the exposure correction.

Claim 1 includes a structure for effectively performing "a process for generating a gradation correction based on a histogram of an entire input image" and "a process for generating an exposure correction based on a histogram of a face region."

A representative luminance of a face region of an image which has been processed based on a gradation correction is needed for generating an exposure correction appropriately. However, if a histogram is generated again after processing the image based on the gradation correction, it is necessary to generate a histogram twice in order to correcting the image. This method is not efficient.

The invention of Claim 1 includes, *inter alia*, "histogram generating means for generating a first histogram of the entire input image and a second histogram of the detected face region," "first generating means for generating a gradation correction for luminance and a gradation correction for each of a plurality of color components based on the highlight point, the shadow point, a target highlight point and a target shadow point," "conversion means for converting the second histogram based on the gradation correction generated for the luminance," "determining means for determining a representative luminance of the detected face region based on the converted second histogram of the detected face region" and "second generating means for generating an exposure correction based on the representative luminance." More specifically, in the invention of Claim 1, the histograms of the entire input image and the face region are generated, the histogram of the face region is converted, and the representative luminance is determined. By virtue of the features mentioned above, the generation of histogram is required only once in the correction of the image.

As described above, Claim 1 includes a structure for effectively combining "a process for generating the gradation correction based on the histogram of the entire input image" and "a process for generating the exposure correction based on the histogram of the face region in the input image" as described below.

Claim 1 includes "first generating means for generating a gradation correction for luminance and a gradation correction for each of a plurality of color components based on the highlight point, the shadow point, a target highlight point and a target shadow point." For example, see creation of LUTR, LUTG, LUTB, and LUTtmp in Step S96 of Fig. 16.

Claim 1 further includes "conversion means for converting the second histogram based on the highlight point and the shadow point the gradation correction generated for the luminance." For example, see Step S97 of Fig. 16.

Claim 1 also includes "determining means for determining a representative luminance of the detected face region based on the converted second histogram of the detected face region." In order for the determining means to determine a representative luminance of the detected face region, it is necessary to calculate the representative luminance of the face region converted based on the gradation correction generated for each of the plurality of color components. Therefore, in the invention of Claim 1, the first generating means generates the gradation correction for luminance as well as the gradation correction for each of the plurality of color components. Furthermore, the conversion means converts the second histogram by using the gradation correction generated for the luminance. By virtue of the features as mentioned above, there is no need to generate a histogram once again after the image is processed based on a gradation correction.

As the Examiner has acknowledged, the Matsuura reference does not teach or suggest a process performed in accordance with the face region. The Office Action alleges that the Detachi reference cures this deficiency in the Matsuura reference.

The Detachi reference teaches (1) calculating a cumulative histogram of an entire image (for example, as shown in Fig. 7 of the Detachi reference); (2)

extracting a face region and detecting a data range of the face region ($x_1 \sim x_2$) (for example, as shown in Fig. 4a of the Detachi reference); (3) generating the first LUT based on the cumulative histogram of the entire image; and (4) setting "1" as the gradient of the data range of the face region of the first LUT as shown below (and in paragraphs [0028] and [0029] and Fig. 4b of the Detachi reference):

$$x_1 = y_1' (=64) \quad x_2 = y_2' (=128)$$

$$\text{input} \geq x_2$$

$$y_n' = y_2 + (y_2' - y_2) \times (x_{255} - x_n) / (x_{255} - x_2)$$

$$\text{input} \leq x_1$$

$$y_n' = y_1 + (y_1' - y_1) \times x_n / x_1$$

The Detachi reference teaches a process in which the first LUT generated based on a histogram of an entire image is converted based on a data range of a face region of the image. However, the Detachi reference does not teach or suggest the features of Claim 1 described above. The Detachi reference merely teaches generating the LUT based on the different algorithms depending on whether to use the data range of the face region or the data range other than the face region.

In contrast, Claim 1 generates two different corrections with different purposes (i.e., the gradation correction and the exposure correction). When the exposure correction is generated, it is important to calculate the representative luminance in consideration of influence of the gradation correction. However, in the Detachi reference, it is impossible to perform the above process of the invention of Claim 1.

For the above reasons, neither Matsuura reference nor the Detachi reference, either taken alone or in combination, teach or suggest the features of Claim 1. Claim 1 is believed allowable. Accordingly, Applicants request reconsideration and withdrawal of the rejection of Claim 1.

Claims 12 and 18 include features similar to those discussed above with reference to Claim 1. Claims 12 and 18 are believed allowable for at least the

same reasons as Claim 1. . Accordingly, Applicants request reconsideration and withdrawal of the rejections of Claim 12 and 18.

The other pending claims remaining under consideration in this application (claims 16 and 17) are each dependent from the independent claims discussed above and are therefore believed to be in condition for allowance for at least the same reasons. Because each dependent claim is also deemed to define an additional aspect of the invention, however, individual consideration of each on its own merits is respectfully requested.

CONCLUSION

Applicants respectfully submit that all of the claims pending in the application meet the requirements for patentability and respectfully request that the Examiner indicate the allowance of such claims.

Any amendments to the claims which have been made in this response which have not been specifically noted to overcome a rejection based upon prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto.

If any additional fee is required, please charge Deposit Account Number 502456.

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Should the Examiner have any questions, the Examiner may contact Applicants' representative at the telephone number below.

Respectfully submitted,

March 16, 2009

/Marlene Klein/

Date

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